PAPER CASSETTE AND PAPER FEEDING APPARATUS

FIELD OF THE INVENTION

The present invention relates generally to a medium cassette and a medium feeding apparatus.

DESCRIPTION OF THE RELATED ART

Image-forming apparatus such as an ink jet printer, an electrophotographic printer, a facsimile machine, and a copying machine are equipped with a paper-feeding apparatus. Japanese Patent Laid Open No. 8-324804 discloses one such paper-feeding apparatus. The paper-feeding apparatus includes a paper cassette having tray sections in which stacks of print paper of various sizes are accommodated. The tray section has guides that define the width or depth of a paper-accommodating space in the tray section to prevent the paper from becoming skewed and determine a region on the print paper in which printing should be initiated. Depending on whether the guides engage the side or edge of the print paper, the guides are generally called a side guide or a tail guide.

There are two types of tray sections: step-wise adjustable type and free adjustable type. For the step-wise adjustable type, side guides or a tail guide is secured by screwing or fitting into the body of the tray section to adjustably set the position of the stack of print paper P. For the free adjustable type such as a universal cassette, the side guides or the tail guide is moved freely to adjustably set the position of the stack.

Fig. 31 is a perspective view of a conventional paper-feeding cassette.

Fig. 32 is a perspective view of the conventional paper cassette when it is loaded with a stack of print paper.

Fig. 33 is a side view as seen in a direction shown by arrow K of Fig. 32.

Referring to Fig. 31, a cassette 101 has a tail guide 102 that is slidably movable back and forth behind the stack of print paper

P to adjust the depth of the paper-accommodating space. Referring to Fig. 33, after the stack of print paper P has been placed in the cassette 101, the tail guide 102 is moved in a plane below the bottom of the stack of the print paper P until the tail guide 102 abuts the print paper.

The cassette 101 has a plurality of grooves 101a. When a locking member of the tail guide 102, not shown, engages the grooves 101a, movement of the tail guide 102 is limited to complete the positioning of the stack of print paper.

When the tail guide 102 is being moved, the tail guide 102 may scratch and damage the bottom few pages of the stack of print paper.

The tail guide 102 is commonly a rectangular solid as shown in Figs. 31 and 32. The bottom pages of the stack of print paper may have become wavy due to moisture absorption and/or improper placement of the stack of paper. As a result, the bottom pages may project into the space 101c in which the horizontal portion of the tail guide 102a moves back and forth. Thus, when the tail guide 102 moves forward, the wavy bottom of the stack of print paper becomes an obstacle to the movement of the tail guide 102, so that the tail guide 102 will damage the print paper P or cause the print paper P to become wrinkled or crumpled.

The locking member of the tail guide 102 engages the groove 101a, which limits the stroke of the tail guide 102. The cassette 101 has a sheet-supporting plate 103 positioned forward of the stroke of the tail guide 102, the sheet supporting plate 103 pushing up the froward portion of the stack of the print paper P. The sheet-supporting plate 103 may be formed of plastics but is usually made of a metal plate. This is because the sheet-supporting plate 103 is required to urge the print paper P against a feed roller, not shown, from bottom while at the same time supporting the heavy stack of print paper P. The sheet-supporting plate 103 is designed to pivot about an axis sufficiently away from the feed roller. This is to ensure only a small difference in the attack angle of the sheet supporting plate 103 with the feed roller between when a large number of pages are

on the sheet supporting plate 103 and when a small number of pages are on the sheet supporting plate 103. Thus, the sheet-supporting plate 103 is made large.

If the sheet-supporting plate 103 is made larger than A5 size paper or A6 size paper, the A5 size paper or A6 size paper will not project further rearward than the rear end of the sheet-supporting plate 103. Therefore, the tail guide 102 will not engage the rear end of the stack of such small size paper, so that the tail guide 102 does not perform its function. Of course, this drawback may be overcome by providing an exclusive guide member instead of the tail guide 102. Alternatively, the sheet-supporting plate 103 may be designed to have a width and a depth as large as the entire floor width of the cassette 101 so that the tail guide can move over a longer stroke. This will increase the manufacturing costs of the apparatus. A large width of the tail guide 102 requires a large aperture through which the tail guide 102 moves back and forth. This will reduce mechanical strength of the cassette 101.

SUMMARY OF THE INVENTION

The present invention was made in view of the aforementioned problems of the conventional image forming apparatus.

An object of the invention is to provide a paper cassette and a paper feeding apparatus that is inexpensive, mechanically strong, and capable of feeding print paper in a stable manner without damaging the print paper.

A medium cassette that holds a stack of print medium (e.g., print paper) therein includes a medium guide member and a supporting member. The medium guide member includes a first member and a second member. The second member has a tapered forward end portion. The supporting member has a groove formed therein by which the medium guide member is guided to move to and from the stack of print medium. When the medium guide member is moved in a direction toward the stack of the print medium in the groove to a predetermined position, the first member abuts an end of the stack of print medium and the tapered

forward end portion slides under the stack of print medium.

The tapered forward end portion extends further downward below a bottom of the stack of print medium.

The second member has an edge that edge extends from a middle portion of the second member leftward and rightward with respect to the direction. The edge becomes further away from the stack of print medium than the middle portion with increasing distance from the middle portion.

The edge extends from the middle portion to describe either a curved line or a straight line.

The paper cassette includes a medium-supporting member on which the stack of print medium is placed, wherein the medium guide member can be mounted on the medium-supporting member.

The medium guide member further includes a projection that extends through the groove. The slide member projection includes second projections that project substantially leftward and rightward with respect to the direction so that the supporting member is sandwiched between the second member and the second projections.

The second projections includes a first set of second projections that extends over a first distance and a second set of second projections that extends over a second distance.

Each of the second projections has a plurality of stepped portions. The supporting member can be held in a sandwiched relation between the second member and a corresponding one of the plurality of stepped portions.

The medium guide member includes a locking member and the medium-supporting member has a recess formed therein by a drawing operation. When the locking member is received in the recess, the medium guide member is locked at a predetermined position.

The medium-supporting member has an opening beside the recess.

A paper feeding apparatus incorporates the aforementioned medium cassette.

A medium cassette that holds a stack of print medium (e.g., print paper) therein includes a supporting member, a medium guide member,

and a medium-supporting member.

The supporting member has a groove formed therein. The medium guide member includes a first member and a second member that slides under the stack of print medium. The medium guide member is detachably mounted to the supporting member and guided in the groove to and from the stack of print medium. The stack of print medium is placed on the medium-supporting member that pushes up the print medium. The medium-supporting member has an opening formed therein through which the medium guide member can be mounted.

A paper feeding apparatus incorporates the aforementioned paper cassette.

Further scope of applicability of the present invention will become apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will become more fully understood from the detailed description given hereinbelow and the accompanying drawings which are given by way of illustration only, and thus are not limiting the present invention, and wherein:

Fig. 1 is a perspective view of a paper cassette according to a first embodiment;

Fig. 2 is a top view of the first embodiment according to the invention;

Fig. 3 illustrates a modification to the edge of the tail guide;

Fig. 4 is a perspective view of the tail guide of Fig. 1 as seen obliquely upward;

Fig. 5 is a bottom view of the tail guide of Fig. 1;

Fig. 6 is a detailed side view of the tail guide taken along lines

VI-VI of Fig. 2;

Fig. 7 is a perspective view of a cassette according to a second embodiment;

Fig. 8 is a side view of the tail guide;

Fig. 9 is a perspective view of the cassette according to the second embodiment when the tail guide is at the opening;

Fig. 10 is a perspective view of the cassette according to the second embodiment when the tail guide is at the opening;

Fig. 11 is a bottom view of the opening;

Fig. 12 is an enlarged side view of a rounded portion R1 of Fig. 11;

Figs. 13 and 14 are bottom views of the groove;

Fig. 15 is a perspective view of a tail guide according to a third embodiment;

Fig. 16 is a side view of the tail guide;

Fig. 17 illustrates the tail guide in detail;

Fig. 18 is a side view of the tail guide when it is attached to the sheet-supporting plate according to the third embodiment;

Fig. 19 is a front view of a lower portion of the tail guide when it is attached to the sheet-supporting plate;

Fig. 20 is a side view of the tail guide when it is attached to the guide portion of the cassette;

Fig. 21 is a front view of a lower portion of the tail guide when it is attached to the guide portion;

Fig. 22 is a side view of the tail guide according to a fourth embodiment when it is locked;

Fig. 23 is an enlarged fragmentary side view of the tail guide when it is locked;

Fig. 24 is an enlarged fragmentary side view of the tail guide when it is locked;

Fig. 25 is a perspective view of the sheet supporting plate according to the fourth embodiment;

Fig. 26 is a side view of the tail guide when the locking tongues 14b are locked;

Fig. 27 is a detailed side view of the tail guide when it is locked;

Fig. 28 is a perspective view of the sheet-supporting plate according to a fifth embodiment;

Fig. 29 is a detailed view of the recess;

Fig. 30 is a fragmentary cross-sectional view taken along line 30-30 of Fig. 29, illustrating a detailed view of the tail guide when it is locked;

Fig. 31 is a perspective view of a conventional paper-feeding cassette;

Fig. 32 is a perspective view of the conventional paper cassette when it is loaded with a stack of print paper; and

Fig. 33 is a side view as seen in a direction of arrow K of Fig. 32.

DETAILED DESCRIPTION OF THE INVENTION

Embodiments of the invention will be described in detail with reference to the accompanying drawings.

First Embodiment

Fig. 1 is a perspective view of a paper cassette according to a first embodiment.

Fig. 2 is a top view of the first embodiment according to the invention.

Referring to Fig. 1, a cassette 10 has a tail guide 12 that is slidably movable back and forth in directions shown by arrow A1 and A2 behind a stack of print paper P to adjust the depth of a space in which the print paper P is accommodated. After the stack of print paper P has been placed in the cassette 10, the tail guide 12 is moved in a plane below the bottom of the stack of the print paper P until the tail guide 12 abuts the print paper P. The cassette 10 has side guides 15d and 15d that are adjustable in directions shown by arrow B1 and B2 toward and away from the sides of the stack of print paper P to laterally guide the print paper. The cassette 10 also has a sheet-supporting plate 15 positioned forward of the stroke of the

tail guide 12, the sheet-supporting plate 15 being pivotal about an axis 15e (Fig. 25) to push up a froward end portion of the stack of the print paper.

Referring to Fig. 2, the tail guide 12 has an arcuate forward end portion 12a with a forwardly tapered thickness. The arcuate forward end portion 12a has an edge 12f that extends leftward and rightward from a middle portion 12c in such a way that the edge 12f becomes further away from the stack of paper than the middle portion 12c with increasing distance from the middle portion 12c. Thus, the leftmost and rightmost ends of the arcuate forward end portion 12a are most away from the stack of the print paper P. The tail guide 12 also has a left straight side 12b and a right straight side 12b that extend in parallel to each other. The left and right sides 12b join with the edge 12f at edges 12g.

The cassette 10 is capable of holding a stack of paper P, and can be incorporated in image-forming apparatus such as ink jet printers, electrophotographic printers, facsimile machines, and copiers.

Referring back to Fig. 1, a guide member 16 has an opening 16e through which the tail guide 12 can be dismounted from the floor member 11.

Fig. 3 illustrates a modification to the edge of the tail guide 12.

Fig. 4 is a perspective view of the tail guide 12 as seen obliquely upward.

Fig. 5 is a bottom view of the tail guide 12.

Referring to Figs. 4 and 5, the tail guide 12 includes a slide 13 at its bottom that slides in a groove 11a formed in the floor member 11. The slide 13 has projections 13a and 13b that project laterally leftward and rightward. When the tail guide 12 is mounted to the cassette 10, the projections 13a and 13b are inserted into the opening 16e and then moved away from the opening 16e along the groove 16a. Guide edge portions 16b define the perimeters of the groove 16a and are loosely sandwiched between the back surface 13d of the tail guide

12 and the projections 13a and 13b of the slide 13. Thus, the tail guide 12 is movable in the groove 16a along the guide 16b.

Fig. 6 is a detailed side view of the tail guide taken along lines VI-VI of Fig. 2.

Referring to Fig. 6, the tail guide 12 has a locking member 14 with a handle 14a and a locking tongue 14b. When the locking tongue 14b engages a locking hole 16c formed in the guide member 16, the tail guide 12 is in a locked state. The locking member 14 has a resilient portion 14d that urges the locking member 14 in the opposite direction to arrow C. When the user operates the handle 14a in a direction shown by arrow C, the locking tongues 14b (only one of two locking tongues 14b is shown) move in a direction shown by arrow D to move out of locking engagement with the openings 16c. Each of the locking tongues 14b has a tapered free end portion 14c that facilitates dismounting of the tail guide 12 from the guide member 16. The guide member 16 has inclined surfaces 16d formed thereon, the inclined surfaces 11g forming the perimeter of the openings 16c. The inclined surface 16d facilitates smooth insertion of the locking tongues 14b into the opening 11c.

The middle portion 12c of the tail guide 12 is tapered and extends further downward than an upper surface 16e of the guide member 16. This is equivalent to saying that the middle portion 12c extends further downward than an upper surface of the sheet-supporting plate 15. Thus, the middle portion 12c can smoothly slide under the edge of the print paper P placed on the floor surface 11d to slightly push up the stack of the paper. Thus, the edge of the stack of the paper P slides upward on the tapered surface of the forward end portion 12a. The edge 12f of the forward end portion 12a is preferably curved without corners as shown in Fig. 2, but may be straight as shown in Fig. 3. Still alternatively, the edge 12f may have some corners provided that the corners make obtuse angles not to catch the edges of the sheets of print paper P.

The operation of the tail guide 12 for positioning the stack of print paper P will be described.

First, the user places a stack of print paper P in the cassette 10 and adjusts the position of the tail guide 12 in accordance with the size of print paper P. At this moment, the trailing edge of the stack of the print paper P slides upward on the tapered surface of the forward end portion 12a. It is to be noted that the edge 12f, which moves into direct contact engagement with the trailing edge of the print paper P, describes a smooth arcuate curve. Thus, the edge 12f will not bite the trailing edges of few bottom pages of print paper P but guide a flat portion 12e of the tail guide 12 to slide under the trailing edge of the print paper P. The smooth sliding motion of the forward end portion 12a prevents the print paper P from becoming wrinkled, crumpled, and/or damaged.

While pushing the trailing end of the stack of print paper P, a vertical wall 12d of the tail guide 12 is moved forward until the vertical wall 12d reaches a predetermined position that corresponds to the size of the print paper P. When the locking tongue 14b moves into engagement with one of the openings 16c, the tail guide 12 is locked so that the stack of print paper P is placed in position.

The arcuate forward end portion 12a should extend as far as the width of the print paper P, so that the wavy trailing edges of few bottom pages of the print paper P will not enter gaps or clearances between the tail guide and inner walls of the cassette 10.

Second Embodiment

In the first embodiment, the cassette 10 has a plurality of openings 16c formed therein for the purpose of positioning the tail guide 12 at an appropriate position in accordance with the size of print paper P. As described in "DESCRIPTION OF THE RELATED ART", if the sheet-supporting plate 15 is made too large, the tail guide 12 fails to properly guide a stack of small size print paper such as A5 size and A5 size. For solving the problem, in a second embodiment, the tail guide 12 is also attachable to the sheet-supporting plate 15 so that the tail guide 12 can guide small size print paper as well.

Fig. 7 is a perspective view of a cassette according to the second embodiment.

Referring to Fig. 7, a floor member 11 has an opening 11e continuous to the forward portion of the groove 16a through which the tail guide 12 can be dismounted from the guide member 16. The sheet-supporting plate 15 has openings 15b and 15b that lie on the same line as the openings 16c and an opening 15a that lies on the same line as the groove 16a. The small opening 15a allows the tail guide 12 to be mounted on the sheet-supporting plate 15 when the tail guide 12 guides small size paper such as A5 size and A6 size. The openings 15b and 15b are used for positioning and locking the tail guide 12.

Fig. 8 is a side view of the tail guide.

Referring to Fig. 12, the slide 13 has projections 13a and 13b that project laterally leftward and rightward. The projections 13a and 13b have rounded upper corner portions as depicted by S1-S4 in Fig. 12.

Fig. 13 is a bottom view of the tail guide.

The projection 13a has a dimension L1 and the projection 13b has a dimension L2, L1 being larger than L2. The projections 13a and 13b are inserted through the opening 16e in such a way that the guide edges 16b forming the perimeters of the groove 16a are loosely sandwiched between the back surface 13d of the tail guide 12 and the projections 13a and 13b.

The tail guide 12 can be dismounted from the guide member 16 through the opening 16e. Also, the tail guide 12 can be mounted to the sheet-supporting plate 15 by inserting the projections 13a and 13b into the opening 15a such that the guide edges 16b are loosely sandwiched between the back surface 13d and the projections 13a and 13b. The tail guide can be dismounted by pulling out the projections 13a and 13b through the opening 15a.

The operation of the tail guide 12 for positioning the paper will be described.

Fig. 9 is a perspective view of the cassette according to the

second embodiment when the tail guide is at the opening 16e.

Fig. 10 is a perspective view of the cassette according to the second embodiment when the tail guide is at the opening 15a.

Fig. 11 is a bottom view of the opening 15a.

Fig. 12 is an enlarged side view of a rounded portion R1 of Fig. 11.

As shown in Fig. 9, the user causes the tail guide 12 to slide along the groove 16a to the opening 16e. The projections 13a and 13b are then pulled out of the opening 16e. Then, the user mounts the tail guide 12 on the sheet-supporting plate 15 by inserting the projections 13a and 13b into the opening 15a as shown in Fig. 10. Then, the user moves the tail guide somewhat rearward so as to lock the locking tongues 14b into the openings 15b and 15b.

The perimeter of the opening 15a has rounded corners as depicted at R1-R4 in Fig. 11. The edge portions of the rounded corners are also chamfered as depicted at S1-S4 in Figs. 8. The aforementioned rounded and chamfered corners cooperate to place projections 13a and 13b in position below the opening 15a, so that the tail guide 12 can move smoothly back and forth in a direction in which the opening 15a generally extends.

When the paper cassette 10 holds print paper P having a relatively larger size than A5 size, the user dismounts the locking tongues 14b from the openings 16c and causes the tail guide 12 to slide forward, thereby pulling out the tail guide 12 from the sheet-supporting plate 15. Then, the user inserts the projections 13a and 13b into the openings 16e formed in the guide member 16 so that the tail guide 12 is again mounted to the groove 16e so that the tail guide 12 is again mounted through the groove 16a.

Figs. 13 and 14 are bottom views of the groove 16a.

As shown in Fig. 13, the edges of the guide edges 16b that form the perimeters of the groove 11a are chamfered at portions R5-R8 and the projections 13a and 13b are chamfered at portions S5-S8. The chamfered portions R5-R8 and S5-S8 facilitate smooth insertion of the projections 13a and 13b into the opening 16e and cooperate with

the chamfered portions S1-S4 in such a way that the projections 13a and 13b are guided rearward under the opening 16e as shown in Fig. 14.

The configuration of the second embodiment allows guiding of print paper P of small sizes such as A5 size and A6 size. Because the projection 13a has a length L1 while the projection 13b has a length L2, there is no chance of the tail guide 12 being attached to the guide member 16 in the wrong orientation.

The configuration of the second embodiment allows the sheet-supporting plate 15 to pivot about an axis away from the feed roller. For example, when a stack of A4 size paper is placed in the cassette, the attack angle of the sheet-supporting plate 15 can be in a relatively small range when the stack has a large number of pages and when the stack has a small number of pages. Thus, the configuration provides reliable feeding of print paper.

Further, the configuration eliminates the need for cutting away a portion of the sheet supporting plate 15 through which the tail guide 12 moves back and forth. This is advantageous since the mechanical strength of the sheet supporting plate 15 can be maintained.

Third Embodiment

In the second embodiment, the guide edge 16b or the sheet-supporting plate 15 of the cassette 11 is sandwiched between the underside 13d of the tail guide 12 and the projections 13a and 13b, thereby allowing the tail guide 12 to slide smoothly. This requires that the guide edge 16b and the sheet supporting plate 15 have the same thickness.

The guide edge 16b of the guide member 16 may be molded from, for example, plastics and the sheet supporting plate 15 may be formed of a metal plate. However, if the guide edge 16b is designed to have the same thickness as the sheet-supporting plate 15, the guide 11b cannot be rigid enough. If the molded guide edge 16b is to have the same thickness as ordinary molded components, the thickness of

sheet-supporting plate 15 will have to be made too large. The sheet-supporting plate 15 is usually made by, for example, bending, drawing, and embossing a metal plate. Using too thick a metal plate results in an increase in manufacturing cost. In a third embodiment, a stepped portion 13c is formed, thereby limiting the upward and downward movement of the tail guide 12 even when the guide 16b and the sheet-supporting plate 15 differ in thickness.

Fig. 15 is a perspective view of a tail guide according to the third embodiment.

Fig. 16 is a side view of the tail guide.

Fig. 17 illustrates the tail guide in detail.

Referring to Figs. 16 and 17, the projections 13a and 13b of the tail guide 12 are of a dual stepped-portion configuration. As shown in Fig. 16, the surfaces 13c of the projections 13a and 13b include an upper surface 13c and a lower surface 13e. As shown in Fig. 17, the distance L3 between the surface 13d of the tail guide 12 and the upper surface 13e is slightly greater than the thickness of the sheet supporting plate 15. The distance L4 between the surface 13d and the tail guide 12 and the lower surface 13c is slightly greater than the thickness of the guide edge 16b.

The width W1 of the stepped portion is slightly smaller than the width W2 of the opening 15a in the sheet supporting plate 15. The width W2 of the lower stepped portion is slightly smaller than the width of the groove 16a formed in the floor member 11.

The operation will be described in which the tail guide according to the third embodiment is used to place a stack of paper in position.

Fig. 18 is a side view of the tail guide 12 when it is attached to the sheet-supporting plate 15 according to the third embodiment.

Fig. 19 is a front view of a lower portion of the tail guide 12 when it is attached to the sheet-supporting plate 15.

Fig. 20 is a side view of the tail guide 12 when it is attached to the guide edge 16b of the cassette 10.

Fig. 21 is a front view of a lower portion of the tail guide 12 when it is attached to the guide edge 16b.

When the tail guide 12 is attached to the sheet-supporting plate 15 through the opening 15a for small size paper, the sheet-supporting plate 15 is sandwiched between the surface 13d of the tail guide 12 and the surfaces 13c of the projection 13a and 13b. Therefore, the upward and downward movements of the tail guide 12 are limited.

Subsequently, when the tail guide 12 is attached to the guide member 16 through the groove 11a, the floor member 11 is sandwiched between the surface 13d of the tail guide 12 and the surface 13c, thereby restricting the upward and downward movements of the tail guide 12.

In the third embodiment, a single tail guide 12 can be used to guide print paper of various sizes.

Fourth embodiment

In the third embodiment the surfaces 13c and 13c are formed for positioning and locking the tail guide 12. The sheet-supporting plate 15 may lose its mechanical strength depending on the areas of the surfaces.

Fig. 22 is a side view of the tail guide 12 according to a fourth embodiment when it is locked.

Fig. 23 is an enlarged fragmentary side view of the tail guide 12 when it is locked.

Fig. 24 is an enlarged fragmentary side view of the tail guide 12 when it is locked.

In the third embodiment, as shown in Fig. 22, the sheet-supporting plate 15 is formed with openings 15b and 15b by which the tail guide 12 is locked at positions where the small size print paper such as A5 size and A6 size are properly guided. If the openings 15b and 15b are made large, the sheet-supporting plate 15 loses its mechanical strength drastically.

As shown in Fig. 23, when the locking tongues 14b of the locking member 14 engage the opening 15b and 15b, the tail guide 12 is locked. When the tail guide 12 is unlocked, the tail guide 12 is moved in a direction shown by arrow E to a position shown in Fig. 24. An

inclined portion 14c of the locking tongue 14b collides an edge 15b, and then climbs on the edge 15b to be unlocked. A frequent operation of the tail guide 12 subjects the inclined portion 14c to wear.

Fig. 25 is a perspective view of the sheet supporting plate 15 according to the fourth embodiment.

Fig. 26 is a side view of the tail guide 12 when the locking tongues 14b are locked.

Fig. 27 is a detailed side view of the tail guide 12 when it is locked.

Referring to Fig. 25, the feature of the fourth embodiment is that a recess 15c is used in place of the openings 15b and 15b. The recess 15c is formed through a drawing operation and has a trapezoidal cross section as shown in Fig. 27. When the tail guide 12 is placed in position to guide the small size paper such as A5 size and A6 size, the locking tongue 14b is received in the recess 15c as shown in Figs. 26 and 27. A vertical surface 14d of the locking tongue 14b abuts a vertical wall 15f of the recess 15c, so that the tail guide 12 is locked.

As described above, the recess 15c having a trapezoidal cross section minimizes wear of the locking tongue 14b. The use of a drawing operation increases the rigidity of the sheet-supporting plate 15, so that the sheet-supporting plate can have a smaller thickness and therefore the manufacturing cost can be saved.

Fifth Embodiment

In the fourth embodiment, if the tail guide 12 is to be reliably locked, the recess 15c needs to be formed with a sufficient depth. Deep drawing requires the metal plate to have a sufficient thickness. An inherent problem of deep drawing is that a thick metal plate has a small curvature when it is drawn. This implies that the corner portions of the cross section of the recess 15c have small curvatures, so that the distance between the vertical wall 15c and an inclined wall 15g is rather short. The feature of a fifth embodiment is that openings are formed on both sides of the recess 15c formed by a drawing

operation.

Fig. 28 is a perspective view of the sheet-supporting plate according to the fifth embodiment.

Fig. 29 is a detailed view of the recess 15c.

Fig. 30 is a fragmentary cross-sectional view taken along line 30-30 of Fig. 29, illustrating a detailed view of the tail guide when it is locked.

Referring to Fig. 28, the sheet supporting plate 15 according to the fifth embodiment is formed with positioning recesses 17 and drawn portions 18a-18c. When the locking tongue 14b of the locking member 14 is received in the positioning recess 17, the tail guide 12 is locked. The positioning recess 17 includes holes 17a formed on both sides of the drawn portion 17b, a drawn portion 17b having a substantially trapezoidal cross section, and cutouts 17c. The distance between ends of the holes 17a is longer than the length W3 of the locking tongue 14b by approximately 1/4 of the length of the locking tongue 14b.

When the tail guide 12 guides the small size paper such as A5 size and A6 size, the locking tongue 14b is received in the holes 17a and drawn portion 17b as shown in Fig. 29. The vertical surface 14d of the locking tongue 14b abuts perimeters 17d of the holes 17a, thereby locking the tail guide 12.

When the tail guide 12 is caused to slide forward (rightward in Fig. 30), the inclined surface 14c of the locking tongue 14b abuts the inclined wall 17b of the drawn portion 17b and climbs up the inclined wall 17b smoothly. Therefore, the inclined wall 14c and inclined surface 17b will not damage or scratch each other, allowing smooth dismounting of the tail guide 12.

While the present invention has been described with respect to a tail guide that guides the trailing edge of the print paper. The invention is also applicable to a side guide that guides the side edge of the print paper.

The invention being thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be

regarded as a departure from the spirit and scope of the invention, and all such modifications as would be obvious to one skilled in the art intended to be included within the scope of the following claims.